

First Beam-Target Double-Polarization Measurements Using Polarized HD at LEGS*

S. Hoblit¹, K. Ardashev², C. Bade², M. Blecher⁶, A. Caracappa¹, A. Cichocki⁵, C. Commeaux⁹,
A. D'Angelo³, R. Deininger², J.P. Didelez⁹, R. Di Salvo³, C. Gibson⁴, K. Hicks², A. Honig¹⁰,
T. Kageya⁶, M. Khandaker¹¹, O.C. Kistner¹, A. Kuczewski¹, F. Lincoln¹, M. Lowry¹,
M. Lucas², J. Mahon², H. Meyer⁶, L. Miceli^{1,4}, D. Moriccianni³, B. Norum⁵, B.M. Freedom⁴,
A.M. Sandorf³, C. Schaerf³, T. Saitoh⁶, H. Ströher⁷, C.E. Thorn¹, K. Wang⁵, X. Wei¹,
C.S. Whisnant⁸ (The LEGS Spin Collaboration)

¹Brookhaven National Laboratory, ²Ohio University, ³Universita di Roma "Tor Vergata"
and INFN-Sezione di Roma2, ⁴University of South Carolina, ⁵University of Virginia, ⁶Virginia Polytechnic Inst. &
State Univ., ⁷Forschungszentrum Jülich, ⁸James Madison University, ⁹Univ. de Paris-Sud (Orsay), ¹⁰Syracuse
University, ¹¹Norfolk State University

A new polarized target utilizing solid molecular HD has been under development at LEGS. The first pion photoproduction data have been taken with this target using both linearly and circularly polarized photon beams. The data on all states are taken at the same time with the polarization of the photon flipping between six states at randomly chosen intervals. These data, allow for simultaneous measurements of the cross sections, the photon beam asymmetry Σ , the E asymmetry (left/right circularly polarized photons on longitudinally polarized nucleons), and the G asymmetry (linearly polarized photons $X45^\circ$ to the reaction plane on longitudinally polarized nucleons), all of which constrain the pion photoproduction amplitudes. Results were obtained for the completely exclusive channels $\pi^0 p$, $\pi^0 n$, $\pi^+ n$, and $\pi^- p$. These data also determine the spin difference cross section ($\sigma_{3/2} - \sigma_{1/2}$) for both the proton and the neutron over the region of the delta, which dominate the $Q^2 = 0$ spin sum rules (Gerasimov-Drell-Hearn and forward spin-polarizability) for both nucleons. Preliminary results will be discussed.

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